Check List the journal of biodiversity data

NOTES ON GEOGRAPHIC DISTRIBUTION

Check List 16 (1): 53–57
https://doi.org/10.15560/16.1.53

PENSOFT

First records of *Myriostoma calongei* Baseia, Sousa & Martín (Geastraceae, Basidiomycota) in central Brazil

Carlos Filipe Camilo-Cotrim, Lucas Leonardo-Silva, Solange Xavier-Santos

Universidade Estadual de Goiás, Campus Anápolis de Ciências Exatas e Tecnológicas, Programa de Pós-Graduação em Recursos Naturais do Cerrado, Laboratório de Micologia Básica, Aplicada e Divulgação Científica (FungiLab), Rod. Br 153, Km 99, Caixa Postal 459, Anápolis, Goiás, Brazil.
Corresponding author: Solange Xavier dos Santos, solange.xavier@ueg.br

Abstract

Myriostoma Desv. is a genus of gasteroid fungi, distinguished from the other star-shaped fungi by the basidioma morphology with multiple pedicels and multi-stomata endoperidium. Studies based on phylogenetic, morphological characteristics and geographical distribution allowed the delimitation of five species in the genus. In Brazil, it is represented by *M. calongei* Baseia, Sousa & Martín, which distribution was restricted to South and Northeast regions. The present study describes the first records of *Myriostoma* in central Brazil, including Cerrado biome and Central-West region, thus expanding the known geographic distribution in the country.

Keywords

Gasteromycetes, gasteroid fungi, geographic distribution, new occurrences.

Academic editor: Claudia López Lastra | Received 10 September 2019 | Accepted 26 December 2019 | Published 17 January 2020

Citation: Camilo-Cotrim CF, Leonardo-Silva L, Xavier-Santos S (2020) First records of *Myriostoma calongei* Baseia, Sousa & Martín (Geastraceae, Basidiomycota) in central Brazil. Check List 16 (1): 53–57. https://doi.org/10.15560/16.1.53

Introduction

Known in some countries as 'pepper pot', *Myriostoma* Desv. is a genus of fungi with rare occurrence but easily distinguished from the other star-shaped gasteroid fungi by the peculiar micromorphology, which is characterized by the presence of multiple pedicels and stomata in the endoperidium, besides the reticulated basidiospores (Sousa et al. 2017). Until recently, the genus was considered monotypic, represented by *Myriostoma coliforme* (Dicks.) Corda, with a cosmopolitan distribution (Leite and Baseia 2007; Hemmes and Desjardin 2011). However, based on molecular phylogenetic evidence, morphological features, and geographic distribution, Sousa et al. (2017, 2018) delimited five species: *M. areolatum* (Calonge & M. Mata) M.P. Martín, J.O. Sousa & Baseia; *M. australianum* J.O. Sousa, Baseia & M.P. Martín; *M. calongei* Baseia, J.O. Sousa & M.P. Martín; *M. capillisporum* (V.J. Staněk) Suz, A.M. Ainsw., Baseia & M.P. Martín, and *M. coliforme*. These species can be morphologically distinguished by the shape of stomata, surface texture of endoperidium, and size and ornamentation of basidiospores. Among these species, only *M. calongei* occurs in Brazil (Sousa et al. 2017, 2018). Here, we describes the first occurrence records of the genus *Myriostoma* from the Cerrado biome (Brazilian Savanna) and from the Brazilian Central-West Region.

Methods

Samples were collected between 2004 and 2009, on litter, in a mesophyllic forest within the Ecological Reserve of the Campus de Ciências Exatas e Tecnológicas

Copyright *Camilo-Cotrim et al.* This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

– Henrique Santillo of the Universidade Estadual de Goiás (16°23′29″S, 048°55′56″W), municipality of Anápolis, state of Goiás, Brazil (Fig. 1). The area comprises a fragment of the Cerrado biome, and it is characterized by phytophysiognomies of cerrado *stricto sensu*, mesophyllic forest (semideciduous seasonal forest or dry forest) and gallery forest.

The taxonomic identification was performed based on the macro and micromorphological characterization, by using a stereomicroscope, an optical microscope (OM), and a scanning electron microscope (SEM). Color identifications was based on Kornerup and Wanscher (1978). Vouchers were deposited in the Herbarium of the Universidade Estadual de Goiás (HUEG), Anápolis, Goiás, Brazil.

Results

Myriostoma calongei Baseia, J.O. Sousa & M.P. Martín, PLoS ONE 12(6): e0177873, 9 (2017).

New records. Brazil. Goiás: Anápolis, 16°23′29″S, 048°55′56″W, Ecological Reserve of the Universidade

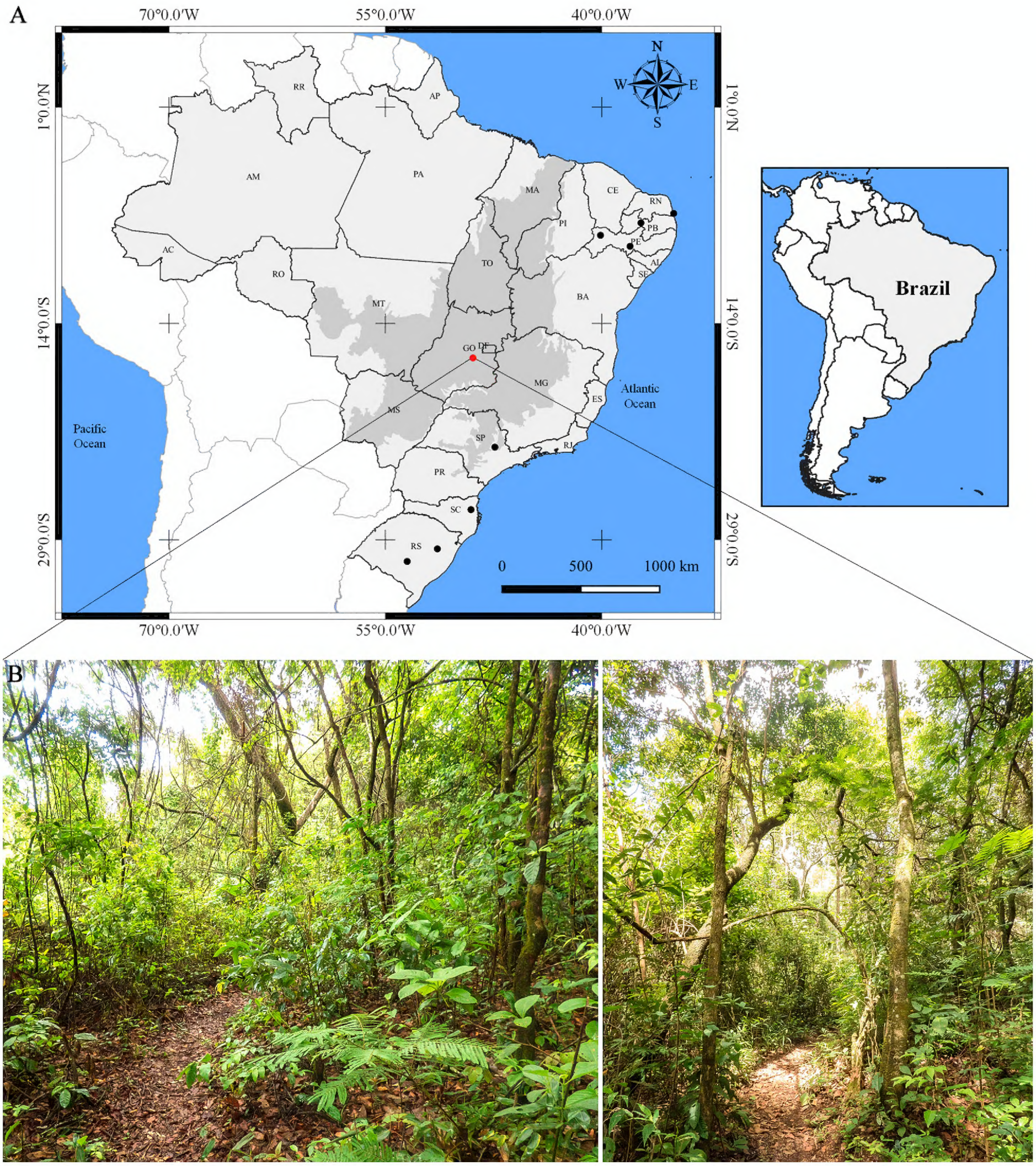

Figure 1. Sampled area and geographic distribution of the genus *Myriostoma* in Brazil. **A.** Location: the darker gray area represents the Cerrado biome; red dot indicates the location of the studied area in the state of Goiás; black dots the known distribution of the genus in Brazil. **B.** Mesophyllic forest of the Ecological Reserve of the Universidade Estadual de Goiás.

Estadual de Goiás, 30 Mar. 2004, Faria Junior, J.E.Q. (06) (HUEG 10535); 14 Jan. 2005, Faria Junior, J.E.Q. (229) (HUEG 10536); 26 Nov. 2009, Xavier-Santos, S. (4162) (HUEG 12981).

Identification. The studied material presents epigeous basidiomata, isolated, 31–76 mm × 26–38 mm, with a slightly rough surface, papyraceous texture with dark brown (6E4) color. Exoperidium, rigid, papyraceous, yellowish brown (5D8) to light brown (5A4), cleaving from the apex towards the base and the slit extends until half of its extension, forming 5–8 rays, regular, curved towards the base, covered with a persistent or detached pseudoparenchymatous thin layer, of dark brown color (6F4). Endoperidium globose to ellipsoid, multipedicellate (7–12 pedicels) and multi-stomata (6–12), rough verrucose surface, with prominent triangular warts, grayish-brown color (5D4), with a shiny metallic appearance, whose dimensions vary from 17–43 × 16–38 mm in length, with 13–23 mm of height. Gleba powdery, dark brown (6E5), formed by basidiospores, capillitium and paracapilitium. Eucapillitium simple, 1.42–2.59 µm in diameter, brownish, with sharp tips. Basidiospores yellowish, globose, with 4.64–6.60 µm in diameter and verrucous wall with curved endoscopic projections under OM. Under SEM, endosporic projections are reticulate, with convergent curves (Fig. 2).

Substrate. Litter.

Distribution of the genus *Myriostoma*. Cosmopolitan (Sousa et al. 2014, 2017, 2018). In Brazil there are records in the states of Paraíba (Baseia and Galvão 2002), Pernambuco (Leite and Baseia 2007), Rio Grande do Norte (Sousa et. al. 2014), Rio Grande do Sul (Homrich 1973), Santa Catarina (Baseia and Galvão 2002), and São Paulo (Homrich 1973) (Fig. 1).

Discussion

The morphological characteristics observed in the studied specimens correspond to those described by Sousa et al. (2017) for *Myriostoma calongei*. This species was recently described and is distinguished from other species of the genus by the presence of a strongly verrucose endoperidium. It closely resembles *M. capillisporum* and *M. australianum*, differing from the former because it presents smaller basidiospores, with a verrucose wall and less prominent reticulations; and from the latter because of the verrucose basidiospores, with flat, confluent, or curved endosporic projections and well-delimited stomata (Sousa et al. 2018).

Sousa et al. (2017, 2018) examined herbarium specimens from North and South America and concluded that specimens previously identified as *M. coliforme* were, in fact, distinct and described *M. calongei* as new. Their phylogenetic analysis (Sousa et al. 2017) included specimens from Argentina, Brazil, and the United States. Thus, all occurrences hitherto reported from Brazil as *M. coliforme* belong to *M. calongei* in the present sense.

The distribution of *M. calongei* in Brazil was previously known for the Atlantic Rain Forest and Caatinga (Sousa et al. 2017). With the present occurrence this distribution also extends to the Cerrado vegetation, showing that it occurs in three different vegetation types, each with distinct characteristics. The Cerrado biome is characterized by a variety physiognomies that encompass savanna and grassland forest formations, where a mixure of trees, shrubs, and undergrowth is observed (Ribeiro and Walter 2008). Our specimens were found in mesophyllic forest, which occurs in interfluviums on more nutrient-rich soils, featured by various levels of deciduous (trees or shrubs that lose their leaves seasonally) in the dry season. Our records for *M. calongei* are the first for the genus from the Cerrado biome and from the Brazilian Central-West Region, and thus increases the knowledge of the geographic distribution of *Myriostoma* in the country.

Acknowledgements

We thank the Universidade Estadual de Goiás (UEG), for the scholarship awarded to CFCC; the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) for the scholarship awarded to LLS; Jair Eustáquio Quintino de Faria Júnior, for collecting part of the studied material; and the reviewers and academic editor for valuable comments and editorial preparation of the paper.

Authors' Contributions

SXS collected some of the material and performed the taxonomic identification; CFCC and LLS prepared the illustration and characterization of the specimens; all authors contributed in the manuscript writing.

References

Baseia IG, Galvão TCO (2002) Some interesting Gasteromycetes (Basidiomycota) in dry areas from northeastern Brazil. Acta Botanica Brasilica 16 (1): 01–08. http://doi.org/10.1590/S0102-33062002000100002

Hemmes DE, Desjardin DE (2011) Earthstars (*Geastrum*, *Myriostoma*) of the Hawaiian Islands including two new species, *Geastrum litchiforme* and *Geastrum reticulatum*. Pacific Science 65 (4): 477–496. https://doi.org/10.2984/65.4.477

Homrich MH (1973) Nota sobre *Myriostoma coliforme* Desvaux (Lycoperdaceae). Iheringia 18 (3): 80–89.

Kornerup A, Wanscher JE (1978) Methuen handbook of colour, 3rd edition. Methuen, London, 252 pp.

Leite AG, Baseia IG (2007) Novos registros de Geastraceae Corda para o Nordeste Brasileiro. Sitientibus. Série Ciências Biológicas 7 (2): 178–183.

Ribeiro JF, Walter BMT (2008). As principais fitofisionomias do bioma Cerrado. In: Sano SM, Almeida SP, Ribeiro JF (Eds) Cerrado: ecologia e flora. Embrapa, Brasília, 152–212.

Sousa JO, Baseia IG, Martín MP (2018) Strengthening *Myriostoma* (Geastraceae, Basidiomycota) diversity: *Myriostoma australianum* sp. nov. Mycoscience 60 (1): 25–30. https://doi.org/10.1016/j.myc.2018.07.003

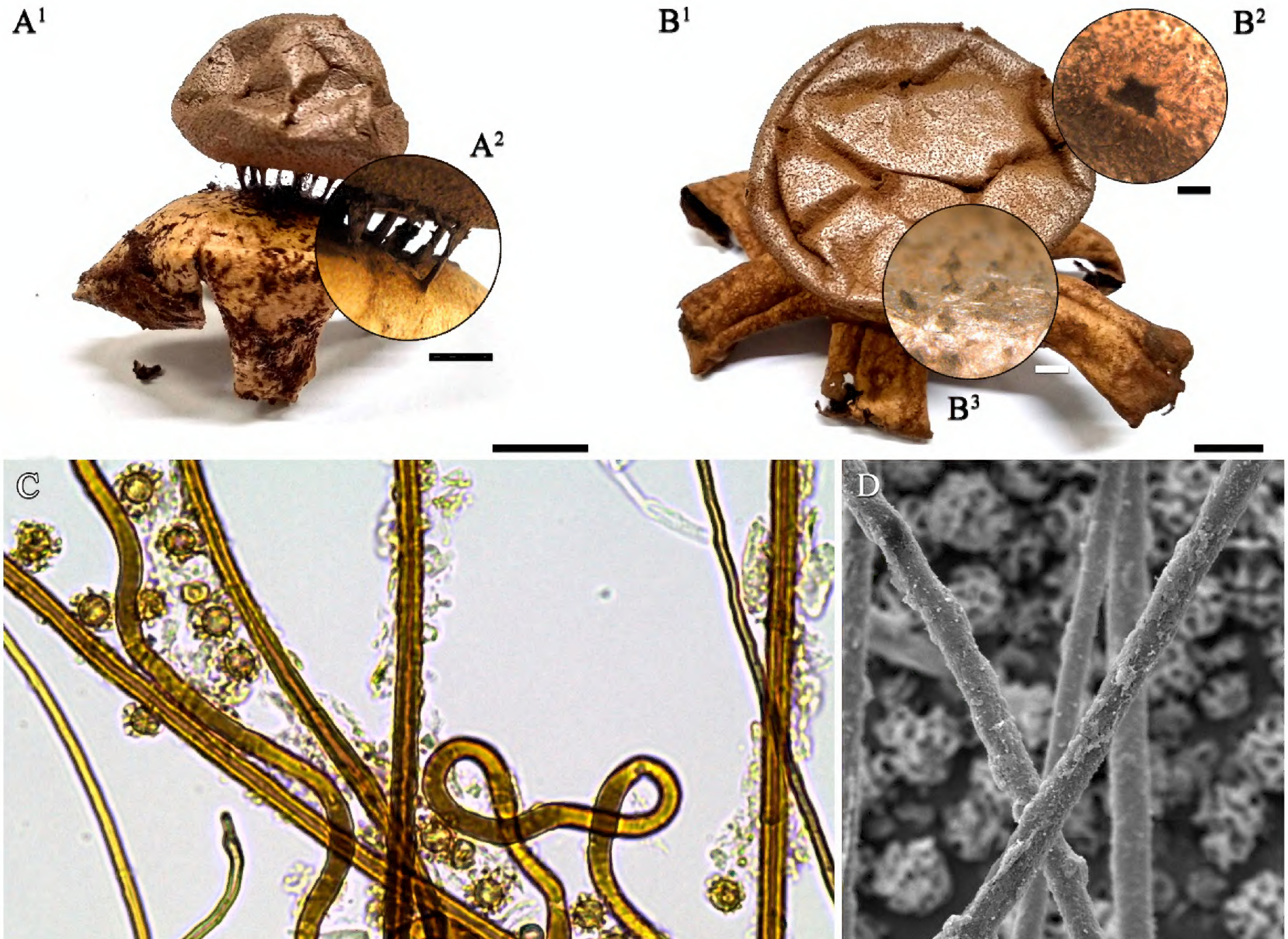

Figure 2. *Myriostoma calongei*. **A[1], A[2].** Side view of the basidioma, focusing on the pedicel. **B[1], B[2], B[3].** Top view of the basidioma, focusing on the verrucose endoperidium and stomata. **C.** Capillitium and basidiospores. **D.** Capillitium under scanning electron microscope. **E, F.** Basidiospores under scanning electron microscope. Scale bars: A[1], A[2], B[1] = 1 cm; B[2] = 1 mm; B[3] = 0.5 mm; C, D, E = 5 µm; F = 1 µm.

Sousa JO, Silva BDB, Alfredo DS, Baseia IG (2014) New records of Geastraceae (Basidiomycota: Phallomycetidae) from Atlantic rainforest remnants and relicts of northeastern Brazil. Darwiniana, Nueva Serie 2 (2): 207–221. https://doi.org/10.14522/darwiniana/ 2014.22.595

Sousa JO, Suz LM, García MA, Alfredo DS, Conrado LM, Marinho P, Ainsworth M, Baseia IG, Martín MP (2017) More than one fungus in the pepper pot: integrative taxonomy unmasks hidden species within *Myriostoma coliforme* (Geastraceae, Basidiomycota). PloS ONE 12 (6): e0177873. http://doi.org/gbgwp4